Remarks

Claims 1-26 stand rejected under 35 U.S.C. § 103 as being allegedly obvious over U.S. Patent No. 6,205,186 ("Butler") and certain secondary references. Claims 1 and 18-26 are amended and new claims 27-34 are added by this paper. The Applicants respectfully submit that the rejections of claims 1-26 should be withdrawn, and that all claims 1-34 are in condition for allowance, for at least the reasons given below.

Butler

Butler uses a Viterbi decoder 56 in a remote station 6 (i.e., mobile phone) to regularly, periodically decode IS-95 paging messages, which are transmitted by a base station 4 as four 20 ms frames per slot 104, where the slot 104 from that particular mobile station 6 recurs with a period of 1.28 sec. or some multiple thereof. When Butler's decoder 56 is not decoding a paging message, it can go into a power-conserving sleep mode.

Butler's Viterbi decoder 56 starts anew to decode each message in its assigned paging slot 104. Although IS-95 has provisions to continue a paging message from one frame to another, each frame is a self-contained data unit, and each slot is independent of other slots. Butler's decoder 56 decodes the frame in a slot from beginning to end, without interruption. In other words, Butler does not suspend decoding of data in a given slot, go perform another task, and then resume decoding of the data in the same slot. Instead, Butler completely decodes a slot (e.g., slot 104a), waits until the next assigned slot (e.g., slot 104b) arrives, and

completely decodes that next slot (104b). Butler's decoding of the second slot (104b) does not depend on information about the decoding of the first slot (104a).

Instead, the problem that Butler faces is to minimize the time it takes for his decoder 56 to become initialized and ready to perform after waking up from sleep mode. Due to the nature of convolutional decoding (in particular, dependence on a significant amount of historical data about the encoding of the data) and the fact that the IS-95 standard dictates interleaving of an entire frame, that initialization can be a significant percentage of the awake time and therefore a significant drain of battery power. This problem arises precisely because Butler's decoder 56 must start anew to decode each slot.

Butler's solution is to put his decoder 56 in a particular initial state before each slot 104 arrives. That initial state is a fixed, static state based on "*a priori*"* knowledge regarding what is likely (or certain) to be the ending state of the incoming convolution code during the previous slot. That initial state is not a dynamic, on-the-fly reaction to the decoding of the previous slot, and it is certainly not a restoration of the decoder's state when its processing of the last slot ended. Butler does not store any such state information. Instead, Butler assumes – based on his *a priori* knowledge about how the IS-95 paging channel is structured – that the initial state

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* The phrase "*a priori*" is Latin, meaning "before." Thus, "*a priori* knowledge" is knowledge known beforehand and typically connotes that whose truth can be deduced independent of actual experience (experiment or observation). In the fields of digital communication and statistical estimation, *a priori* knowledge is knowledge that can be deduced before "the system is turned on" or before any observations are made. The letter "*a*" in the phrase "*a priori*" is not to be confused with the indefinite article "*a*" appearing before nouns in the English language; the two words "*a*" and "*priori*" are not separable in this phrase and should always be used together as an adjective.

should be a specific state, such as all zeros. If necessary, Butler constrains his use of the IS-95 paging channel to ensure that this is true by ensuring that the last few bits of any slot 104 are padded with zeros. Only if decoding of the previous slot ended in that specific state will Butler's initial conditions be correct for decoding the next slot. Butler's system cannot handle any arbitrary ending condition.

Claims 1-9

Independent claim 1 reads as follows:

> 1. An apparatus comprising:
> a decoder to decode a plurality of data streams from a plurality of respective distinct data sources, said decoder having a state associated with each of said plurality of data streams; and
> a state restoration logic to restore said decoder's state upon switching from decoding one data stream to another data stream.

Butler does not teach or disclose claim 1 because Butler does not concern "a plurality of data streams from a plurality of respective distinct data sources." The rejection has equated the recited "plurality of data streams" with the plural assigned slots 104a and 104b (Figure 4). However, the data in each of those slots are from the same data source – namely, the base station communicating with the mobile phone. That is the context of the sole problem with which Butler is concerned, and Butler's solution is narrowly tailored to this context. Butler neither discloses or suggests any teaching of decoding "a plurality of data streams from a plurality of respective distinct data sources." Neither Kaewell (U.S. Patent No. 6,404,828, which is cited only for its teaching of certain memory arrays in a Viterbi decoder) nor the other references of record cure this deficiency in Butler.

Should the Office consider citing another reference as teaching handoff from one base station to another base station, and arguing that such base stations constitute "a plurality of respective distinct data sources," as recited in claim 1, that would be incorrect. At any given time, Butler's remote station 6 communicates with a single base station 4. At no time does Butler's remote station 6 receive "a plurality of data streams from a plurality of respective distinct data sources."

Because claim 1 is allowable over the references cited, its dependent claims 2-9 are also allowable.

Claims 10-13

Independent claim 10 reads as follows:

> 10. A method for concurrently decoding a plurality of data streams comprising:
> decoding a first portion of a first data stream in said plurality of data streams, said first data stream having a state associated therewith following said decoding of said first portion;
> decoding portions of other data streams in said plurality of data streams;
> restoring said state associated with said first data stream; and
> decoding a second portion of said first data stream in said plurality of data streams.

Butler does not teach or disclose claim 10 because Butler's decoder 56 does not decode a first data stream's "first portion" and "second portion" in separate steps. Instead, as noted above, Butler's decoder 56 completely decodes the data in an entire slot without interruption. According to the Office Action's reasoning, the data in a second slot is a new data stream, not a "second portion of said first data stream." (Office Action, page 2, paragraph 2) Indeed, while Butler teaches that frames within

the same slot may be continuation frames (col. 5, lines 36-56), Butler does not teach that paging messages can be continued across slots.

Furthermore, Butler certainly does not teach "decoding other portions of other data streams" between the decoding of the first and second portions of the first data stream. Rather, Butler's remote station 6 enters a sleep mode – and therefore decodes nothing – between assigned paging slots 104. To be sure, the prime objective of Butler's invention is to maximize the duration of that sleep mode. (Col. 2, line 36 – col. 3, line 12.)

Neither Kaewell nor the other references of record cure these deficiencies in Butler. Because claim 10 is allowable over the references of record, the Applicants respectfully request allowance of claim 10 and its dependent claims 11-13.

Claims 14-17

Independent claim 14 reads as follows:

> 14. An apparatus comprising:
> a plurality of data arrays for storing survivor path data for a plurality of data streams;
> a buffer for storing a plurality of path metric values associated with each of said plurality of data streams; and
> state restoration logic for selecting a particular data array and a particular set of path metric values associated with a particular data stream upon receiving a signal indicating a switch to decoding said particular data stream.

In rejecting claim 14 under 35 U.S.C. § 103 over Butler in view of Kaewell, the Office Action contends that Butler discloses "state restoration logic for selecting a particular data array and a particular set of path metric values associated with a particular data stream upon receiving a signal indicating a switch to decoding said particular data stream." That is not so. Butler's decoder 56 does no selecting

whatsoever. Rather, Butler puts his decoder 56 in one particular initial state before decoding each assigned slot 104. As noted above, Butler's initial state may or may not be a restoration of the decoder's previous state, depending what that previous state was. Only if the previous state happens to match that one particular initial state (i.e., only if Butler's *a priori* knowledge turns out to be true), will there be a "restoration" of the decoder to its previous state. Clearly, always utilizing the same initial state to do "restoration" is not restoration by "selecting."

Kaewell does not cure this deficiency in Butler. Kaewell is cited only for its teaching of certain arrays in a Viterbi decoder. However, as the Office acknowledged in the first Office Action, Kaewell does not concern "state restoration" of a decoder. (See First Office Action dated Jan. 1, 2005, page 4, paragraph 4 ("However, Kaewell, Jr. does not explicitly reach restoring the state of data strem while switching to a different data stream")). Kaewell certainly does not disclose "selecting a particular data array and a particular set of path metric values associated with a particular data stream upon receiving a signal indicating a switch to decoding said particular data stream." Even if Kaewell did teach such "selecting," that would be fundamentally incompatible with the approach taken by Butler and therefore not a teaching to modify Butler.

For the foregoing reasons, the Applicants submit that claim 14 and its dependent claim 15-17 are allowable.

Claims 18-26

Independent claim 18 reads as follows:

18. An apparatus comprising:

a decoder to decode a plurality of data streams, said decoder having a state associated with each of said plurality of data streams at any given time, said state being an arbitrary one of a set of possible states;

a state restoration logic to dynamically restore said decoder's state upon switching from decoding one data stream to another data stream.

Butler does not anticipate or render obvious claim 18 because Butler's decoder 56 does not have "state restoration logic to dynamically restore said decoder's state upon switching from decoding one data stream to another data stream," where "said state [is] an arbitrary one of a set of possible states." Butler cannot arbitrarily restore his decoder 56 to any arbitrary state because Butler always "restores" his decoder before each slot 104 to one particular initial state, which may or may not be the same state as the decoder 56 when it was last decoding. Butler's decoder restoration scheme does not have any flexibility to make its initial state match a previous arbitrary state. Instead, Butler's static restoration/initialization scheme assumes or forces the previous slot's ending state to be the one state that it will initialize to before the next paging slot.

Neither Kaewell nor any other reference cures this deficiency in Butler. Accordingly, claims 18-26 are allowable.

Claims 27-35

Independent claim 27 reads as follows:

27. A method for intermittently decoding a data stream, the method comprising:

performing a decoding operation on said data stream, said decoding operation being characterized at any given time by state information as the decoding operation is performed;

> suspending performance of the decoding operation;
>
> storing said state information for the point at which said decoding operation was suspended; and
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> after completion of said suspending step, resuming said decoding operation using the stored state information to establish an initial state for said decoding operation going forward from the time when said resuming begins.

Butler does not teach or disclose claim 27 for at least three reasons. First, Butler never "suspend[s] performance of [a] decoding operation." As previously explained, Butler completely decodes the data in each slot from beginning to end without interruption or suspension. When the next slot arrives, Butler's decoder begins anew a new decoding operation. Butler's decoding of the data in the next slot is not a resumption of the same decoding operation because the data in that next slot is self-contained and not dependent on the previous slot. Indeed, Butler must re-initialize his decoder 56 prior to commencing the new decoding operation during the next slot.

Second, Butler does not "stor[e] said state information for the point at which said decoding operation was suspended." Because Butler's decoder 56 does not suspend any decoding operation, it perforce does not store any state information associated with such a suspension. Butler has no need to store such state information because his decoder 56 completely decodes an entire slot and then later decodes the next slot from a fresh start.

Third, because no state information from the point of suspension (or any point from the decoding of the first slot) is used by Butler to decode the next slot, Butler does not "resum[e] said decoding operation using the stored state information to

establish an initial state for said decoding operation going forward from the time when said resuming begins." Rather than being based on such stored data (i.e., actual experience – see footnote, page 10), Butler's initial state is a static value based on *a priori* knowledge.

In sum, Butler fails to teach or suggest claim 27, and none of the other references can cure Butler's deficiencies. Claims 27-34 are therefore patentable and should be allowed.

Conclusion

In view of the foregoing, the applicants respectfully that all claims are in condition for allowance. A Notice of Allowance is respectfully requested.

Respectfully submitted,

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